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ABSTRACT

The curriculum guide for secondary level, career-oriented General Mathematics Part 1, correlates performance objectives in basic mathematics with career-oriented concepts and activities. The material is designed to lead the student in a systematic development that provides for continuous progress. The guide is in outline format, providing a curriculum outline, performance objectives, and related (career-oriented) concepts, objectives, and learning activities. The guide encompasses the main topic areas of developmental arithmetic, introduction to algebra, geometry, measurement, introduction to statistics, and enrichment topics. (NJ)

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MATHEMATICS CURRICULUM GUIDE
CAREER ORIENTED
GENERAL MATHEMATICS
PART I

Louisiana State Department of Education

Louis J. Michot, Superintendent

1974

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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BULLETIN NO. 1270

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MATHEMATICS CURRICULUM GUIDE

(CAREER ORIENTED)

GENERAL MATHEMATICS

PART I

LOUISIANA STATE DEPARTMENT OF EDUCATION

Louis J. Michot

State Superintendent

May 1974

VT 102466

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PREFACE

The first working draft of the Mathematics Curriculum Guide, Secondary Level was distributed for field testing for the 1973-74 academic year. Feedback indicated that the materials were appropriate for the purposes as stated in the original preface.

The materials presented herein have been changed from the original only in that the mathematical language has been made as uniform as possible for clarity and to conform to the texts adopted by the State of Louisiana. Additional career learning activities have been introduced.

The format has been revised so that it should be easier to correlate the curriculum outlines and performance objectives with the related career oriented concepts and learning activities.

The reader who is seeing the materials for the first time can be assured that the career approach of these guidelines in no way weakens the present program. As in all good educational procedures, materials are included so that all levels may be served. In addition to the ambitious minimum recommendations the guidelines contain ample extension materials for those students who need to be challenged.

Mathematics is embedded in all of the disciplines and makes a solid base for experiences in career education. This is borne out by the numerous references and career activities from the spectrum of life.

The student is led in a systematic development that is designed to provide for continuous progress. Dignity of the person was always foremost in devising and revising the guidelines. The goals were set to give maximum development of the individual through all types of educational experiences.

Finally, our schools will always have a basic curriculum. The methods of instruction will be constantly changing, and the counselors will continue to lend their influence in guiding the pupil. The career education goals which are interwoven with the traditional will help make more productive citizens of Louisiana's most important assets, its children.

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GENERAL MATHEMATICS PART I

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
I. Developmental Arithmetic	I. Developmental Arithmetic
A. Meaning and illustrations of sets	A. To demonstrate a basic understanding of sets, the student should be able to:
1. Kinds of sets a. Finite set b. Infinite set	1. Define and illustrate: a. Finite set. b. Infinite set.
2. Identify elements a. Rule b. Roster	2. Specify the elements of given sets by: a. Rule. b. Roster.
3. Subset of a set	3. List the subsets of the given set A, such as A = {1, 2, 3, 4}.
4. Comparison of two sets	4. Compare two given sets A and B by using the correct relation(s). a. n (A) = n (B). b. n (A) $\neq$ n (B). c. n (A) > n (B). d. n (A) < n (B).
5. Definition and identification	5. Give a problem similar to the following: U = {a, b, c, d, e, f}; A = {a, b, c,}; B = {c, d, e}; C = {f}. Draw a Venn diagram to illustrate each of the following sets:

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
I. Career Concept Different careers are interrelated. Performance Objectives A. People in all walks of life use sets.	A. The mechanic uses a set of wrenches; the draftsman uses a set of drafting instruments to draw plans of structures or machines; the homemaker uses a set of dishes. On 3 × 5 cards list jobs and careers from the different job clusters. On other cards list sets of things that are used in the jobs or careers. Have the student match the job cards to the correct sets.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
a. Universal set, U b. Empty set, ϕ c. Union of sets d. Intersetion of sets e. Disjoint sets f. Complement of a set	a. $A \cap B$. b. $A \cup B$. c. $A \cap C$; A and C are called _____ sets: $A \cap C$ is the _____ set. d. $\bar{A}$.
B. Counting	B. To demonstrate a basic understanding of counting, the student should be able to:
1. By 2's	1. Count to 100 by 2's.
2. By 5's	2. Count to 100 by 5's.
3. By 10's	3. Count to 1,000 by 10's.
4. Distinction between odd and even numbers	4. Select from a given list of numbers: a. Odd numbers. b. Even numbers.
5. Halves	5. Count by: a. Halves. b. Thirds. c. Fourths. d. Tenths.
6. Thirds	
7. Fourths	
8. Tenths	

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
B. A cashier in a bank uses a basic knowledge of counting.	B. The cashier counts money to people making a withdrawal usually by the denominations of the bills. e.g., 5's, 10's, and 20's. Have students play the games Monopoly or Life. The cashier should be able to count currency correctly at the proper times. If desired the cashier may be changed while the game is in progress so that other students may have the opportunity to count different denominations of currency.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
C. Expanded notation and place value.	C. To demonstrate a basic understanding of expanded notation and place value, the student should be able to:
1. Expanded notation	1. Write a two-digit number in expanded notation.
2. Reading of whole numbers	2. Read numbers not exceeding one billion.
D. Addition of whole numbers	D. To demonstrate a basic understanding of addition, the student should be able to:
1. Identification and application of properties	1. Identify and apply: a. The closure property for addition. b. The commutative property for addition. c. The associative property for addition. d. The identity property for addition. e. The cancellation property for addition.
2. Basic addition facts	2. State the basic addition facts.
3. Application of expanded notation	3. Apply expanded notation to:

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
C. Radio and television announcers read large numbers over the air for news stories as well as for election returns.	C. Collect newspaper articles that have large numbers within the story. Students will read the articles as news announcers. At local and state election times, collect articles that include election returns. Collect the election returns from the teletype machine of a radio station, television station or newspaper office. Have students read the results as newscasters.
D. Department managers within factories use addition daily in their work.	D. Henry's department checks parts for a bicycle factory, sorting them as acceptable or as rejects. On Monday, they found 493 acceptable parts and 2 rejects; on Tuesday, 561 acceptable and 4 rejects; on Wednesday, 389 acceptable and 9 rejects; on Thursday, 461 acceptable and 6 rejects; and on Friday, 533 acceptable and no rejects. How many acceptable parts did they find for the week? How many rejects? Arnold played 18 holes of golf with the score on each hole as follows: First nine Hole no. 1 2 3 4 5 6 7 8 9 Par 4 4 3 5 4 4 4 5 3 Arnold 5 7 4 4 5 5 4 7 3

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
	a. Adding two-digit numbers. b. Adding three-digit numbers. c. Adding columns of numbers.
E. Subtraction	E. In order to demonstrate a basic understanding of subtraction, the student should be able to:
1. Inverse of addition	1. Identify and apply subtraction as the inverse of addition.
2. Basic subtraction facts.	2. State the basic subtraction facts.
3. Subtraction without regrouping	3. Subtract without regrouping.
4. Application of expanded notation	4. Apply expanded notation to: a. The subtraction of two-digit numbers. b. The subtraction of three-digit numbers.
F. Multiplication	F. In order to demonstrate a basic understanding of multiplication, the student should be able to:
1. Identification and application of properties	1. Identify and apply: a. The closure property for multiplication. b. The commutative property for multiplication.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
	Second nine Hole no. 10 11 12 13 14 15 16 17 18 Par 4 5 4 4 3 4 5 4 3 Arnold 6 5 5 5 2 5 6 4 3 What was Arnold's score for the first nine holes? What was his score for the eighteen holes? What is par for the first nine and for the eighteen holes?
E. Salesmen for wholesale companies must travel to many different towns. They use subtraction in determining the shortest routes to travel.	E. John Stoner calculated the distance from Chicago to Miami by one route to be 1374 miles, by a second route to be 1445 miles, and by a third route to be 1423 miles. How many miles more must he travel if he chooses the third route instead of the shortest route?
F. The farmer uses multiplication of whole numbers.	F. The farmer has 1,000 head of steers in a feed lot. The average weight per steer is 700 pounds. The water requirement for a 700 pound steer is 12 gallons per day. How many gallons of water will be required to water the 1000 steers each day? How much water will be required in a month?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
	c. The associative property for multiplication. d. The identity property for multiplication. e. The inverse property for multiplication. f. The distributive property for multiplication over addition. g. The multiplication property of zero. h. The cancellation property for multiplication.
2. Repeated addition	2. Express the multiplication of whole numbers as repeated addition.
3. Statement of facts through 12 × 12	3. State the multiplication facts through 12 × 12.
G. Division	G. In order to demonstrate a basic understanding of division, the student should be able to:
1. Repeated subtraction	1. Divide by means of repeated subtraction, e.g., 24 ÷ 6 = 4. because: 24 - 6 = 18; 18 - 6 = 12; 12 - 6 = 6; 6 - 6 = 0.
2. Inverse of multiplication	2. Identify and apply division as the inverse of multiplication.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
G. The production manager uses division of whole numbers in his work.	G. The production manager reports that 1815 pounds of cereal were manufactured on Monday; 2145 pounds on Tuesday; 1980 pounds on Wednesday; 2310 pounds on Thursday, and 1650 pounds on Friday. The cereal was packaged in 11 ounce packages. How many packages of cereal were produced each day? How many for the week? If the company had used 15 ounce packages, how many packages would be produced for the week?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
3. Division by a one-digit number	3. Divide a multi-digit number by a one-digit number; e.g., $24 \div 6 = 24 \times \frac{1}{6} = 4$.
4. Division by two-digit and three-digit divisors	4. Divide by a two-digit or three-digit divisor.
5. Checking by multiplication	5. Check division by multiplication.
6. Impossibility of division by zero	6. Explain why division by zero is impossible (using repeated subtraction).
H. Whole numbers and their factors	H. In order to demonstrate a basic understanding of whole numbers and their factors, the student should be able to:
1. Multiples	1. List five multiples of a given number.
2. Factors	2. List the set of all factors of a given number.
3. Primes and composites	3. From a given set of numbers, identify: a. Primes. b. Composites.
4. Unique factorization theorem	4. Express a given number as a product of its prime factors.
5. Least common multiple	5. Determine the least common multiple of two given numbers.
6. Greatest common factors	6. Determine the greatest common factor of two given numbers.

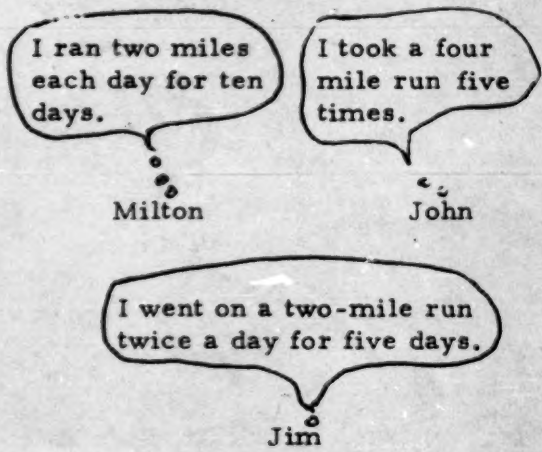
RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

Solution:

	11oz.	15 oz.
Monday	2640	1936
Tuesday	3120	2288
Wednesday	2880	2112
Thursday	3360	2464
Friday	2400	1760
Total	14,400	10,560

H. Athletes use factors in different ways in oral communication.

H. Milton, John, and Jim are preparing for the olympics.


I ran two miles each day for ten days.
Milton
I took a four mile run five times.
John
I went on a two-mile run twice a day for five days.
Jim

Write the expressions to show the number of miles that Milton, John, and Jim walked.

2×10 4×5 $2 \times 2 \times 5$

What number does each expression name? Which expression is written with only prime factors?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
I. Fractional numbers	I. Fractional numbers
1. Fractions	1. To demonstrate a basic understanding of fractions, the student should be able to:
a. Numerator and denominator	a. Identify the numerator and the denominator of the fraction $\frac{a}{b}$
b. Reading and writing fractions	b. Read and write fractions.
c. Equivalent	c. List the equivalent fractions from a given set of fractions.
d. Comparison	d. Use the symbols =, >, <, to compare fractions like the following: $\frac{5}{8} \bigcirc \frac{3}{4}$; $\frac{1}{2} \bigcirc \frac{5}{10}$; $\frac{2}{3} \bigcirc \frac{5}{9}$.
e. Addition	e. Add two or more fractions: (1) With equal denominators. (2) With unequal denominators.
f. Subtraction	f. Subtract fractions: (1) With equal denominators. (2) With unequal denominators.
g. Multiplication	g. Multiply two or more fractions.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
I. Compilers of the yearly United States Almanac use fractional numbers.	I. In America 4/5 of our population lives in cities that occupy 1/50 of our land. If the area of the United States is approximately 2,800,000 square miles and our population is aproximately 205 million people, how many people live in cities? How many square miles of land do they occupy? Answer: 164,000,000 people 56,000 square miles
Lumber salespeople use fractional numbers in denoting thickness of boards.	Example: Lumber yards sell boards 5/4" in thickness and refer to them as 5-quarter boards. What would be the total thickness of 6 five-quarter boards?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
h. Division	h. Divide a fraction by a fraction.
2. Decimals	2. To demonstrate a basic understanding of decimals, the student should be able to:
a. Notation	a. Read and write decimals.
b. Rounding	b. Round a given decimal such as 2,601,000.32756 to: (1) Thousandths. (2) Hundredths. (3) Tenths. (4) Thousands. (5) Millions.
c. Repeating and terminating	c. Define and give an example of a: (1) Repeating decimal. (2) Terminating decimal.
d. Addition	d. Compute the sum of two or more given decimals: (1) With the same number of decimal places. (2) With different numbers of decimal places.
e. Subtraction	e. Compute the difference of two decimals.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
Weathermen, carpenters, nurses, physicians, dentist, bankers, store clerks, and many others must be able to read and compute with decimals.	Learning activities that involve how some of these use decimals are left to the initiative of the individual teacher. Reconcile the following bank balance. For one month the balance in the checkbook at the end of the month was $689.58. The balance of the bank statement was $483.50. A deposit of $302.10 was in transit. The checks outstanding for the month before were #86 ($48.12), #89 ($9.56), # 90 ($32.17), and #91 ($25.03). These checks were written in the present month: #92 ($105.00, #93 ($14.27), #94 ($31.15), #95 ($40.00), #96 ($8.53), #97 ($18.29), #98 ($26.25), #99 ($50.00), and #100 ($15.50). These checks were paid by the bank during the present month: #86, #89, #90, #91, #92, #94, #96, and #97. There was a bank debit memo for $10.00 for the rent of his safe deposit box for one year.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
f. Multiplication	f. Compute the product of two decimals.
g. Division	g. Divide a decimal by a decimal.
3. Conversion of:	3. To demonstrate a basic understanding of converting, the student should be able to:
a. Decimal form to fractional form	a. Convert given decimals to fractions.
b. Fractional form to decimal form	b. Convert given fractions to decimals.
J. Ratio, Proportion, and Percent	J. To demonstrate an understanding of ratio, proportion, and percent, the student should be able to:
1. Ratio	1. Express in two notations the ratio of boys in the class to girls in the class.
a. Definition	
b. Writing ratios	
2. Proportion	2. Solve problems by using proportion.
a. Definition	
b. Means and extremes	
c. Problem solving	
3. Percent	3. Express a given percent as a fraction and as a decimal.
a. Definition	
b. Ratio-percent relationship	
c. Problem solving	

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
J. A pollster uses ratio and proportion in analyzing data. Results of polls are often expressed as percents.	J. In a survey of 1,000 voters just before an election, a pollster found that 750 people intended to vote for candidate A and 250 intended to vote for candidate B. What was the ratio of those in favor of A to the total number of votes included in the poll? What was the ratio of the number in favor of B to the toal number of voters included in the poll? What percent of the total votes could candidate A expect Soltuion: 3:4 1:4 75%
The credit manager of a bank uses percent. Salespeople should be able to solve problems involving their earnings paid on a commission basis.	Compute the commissions earned by these salespeople. These are the various commission plans. Plan I: No quota. Commission is paid on all sales. Plan II: Commission is paid only on sales over the quota. Plan III: Commission is paid on all sales if the quota is made.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
	4. Solve problems computing: a. Percent one number is of another number. b. Percent of a number. c. A number when the precent (rate) and the percentage are known.
K. Problem Solving	K. In order to demonstrate a basic understanding of problem solving, the student should be able to solve simple one-step and two-step problems.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

Salesperson	Sales	Quota	Rate	Plan
Flora	$625.34	None	3%	I
Rex	740.35	$550	4%	III
Marshall	699.36	450	4%	III
Sandra	451.02	None	3%	I
Chauncey	928.59	600	4%	II
Harold	874.27	500	3%	II
Neal	957.36	550	3%	II
Yolanda	416.84	550	3%	II

K. Astronauts must solve problems encountered in space exploration.

K. On July 20, 1969, astronaut Neil Armstrong landed on the moon in a Lunar Module. He walked on the lunar surface for .0972 of an earth day. Calculate this in hours and minutes (approximately).

A contractor must solve problems to determine the cost of remodeling or building.

Mr. Brown, a contractor, was asked to submit a bid price on remodeling a kitchen. He had to include 2 new cabinets @ $350.00 each, a built-in oven @$245.50, a cook top @ $150.00, a dishwasher @$185.00, and a new sink @ $60.00. The labor for removing the old appliances and cabinets, and installing the new ones would be $1,000. He desires a profit of 10 percent of his total cost. What should his bid price be?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
II. Introduction to Algebra	II. Introduction to Algebra
A. Symbols, terminology, and order of operations	A. To develop a basic understanding of symbols, terminology, and order of operations, the student should be able to:
1. Identification of symbols	1. Identify mathematical symbols: $=$, $\neq$, $>$, $<$, $+$, $-$, $\times$, $\cdot$, $\div$, $\frac{x}{y}$, ( ), [ ].
2. Definition and illustration	2. Define or illustrate: a. Positive number (on the number line). b. Negative number (on the number line). c. Equation. d. Inequality. e. Absolute value. f. Variable. g. Coefficient. h. Constant. i. Integer. j. Additive identity. k. Additive inverse of a given number. l. Multiplicative identity. m. Multiplicative inverse (reciprocal).

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
II. Career Concept Individuals have different abilities, interests, needs, and values. Performance Objectives A. A school cafeteria manager uses positive and negative numbers to determine daily income and expenses.	A. Positive numbers are often used to indicate income and negative numbers to indicate expense. Study these receipts and purchases of a school cafeteria: 1. Bread purchase, $4.40 2. Soda receipts for student government meeting, $3.50. 3. Doughnut receipts, $1.10. 4. Milk purchase, $2.00. 5. Purchase of rolls, $2.75. 6. Purchase of lunch meat, $3.75. 7. Receipts from teacher's lunches, $28.30. 8. Purchase of ice cream, $4.80. 9. Coffee receipts for teacher's lounge, $5.60. Identify each item as either income or expense. Label as positive the numerals for income, and as negative, the numerals for expenses. Compute both the total income and the total expense. Compute the profit or loss.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
B. Properties of numbers	B. To demonstrate a basic understanding of the properties of numbers, the student should be able to express, recognize, and use:
1. Closure a. Addition b. Multiplication	1. The closure property for: a. Addition. b. Multiplication.
2. Commutative a. Addition b. Multiplication	2. The commutative property for: a. Addition. b. Multiplication.
3. Associative a. Addition b. Multiplication	3. The associative property for: a. Addition. b. Multiplication.
4. Identity a. Addition b. Multiplication	4. The identity property for: a. Addition. b. Multiplication.
5. Inverse a. Addition b. Multiplication	5. The inverse property for: a. Addition. b. Multiplication.
6. Distributive (for multiplication over addition)	6. The distributive property for multiplication over addition.
C. Monomials and Polynomials	C. To demonstrate a basic understanding of monomials and polynomials, the student should be able to:

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
B. Everybody uses all of the properties of numbers in his daily activities. In particular, the computer programmer uses the distributive property to save steps in computing. This results in reduced computer time and cost.	B. A bookstore sells paper at 18¢ a pack. On Monday 35 packs were sold, and on Tuesday 28 packs were sold. Write the number sentence for the money paid, using the distributive property.
C. A mathematician uses algebraic expressions to rewrite word expressions.	C. Study each word expression. Write an algebraic expression for each.

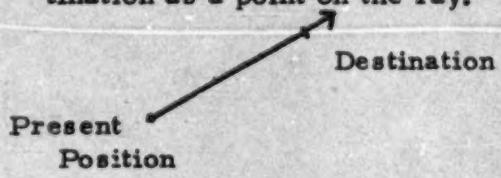
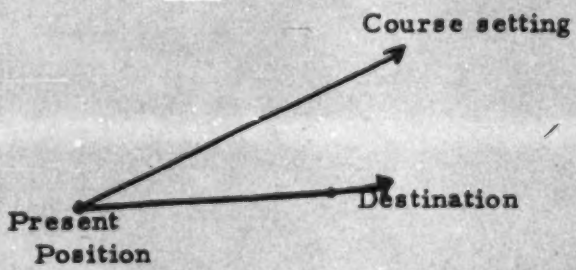
CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
1. Identification and definitions	1. Identify monomial, binomial, and other polynomials.
2. Writing in descending powers	2. Write polynomials in descending powers; e.g., $y^2 + 4 + 8y^3 + y = 8y^3 + y^2 + y + 4$.
3. Addition	3. Add polynomials.
4. Subtraction	4. Subtract polynomials.
5. Multiplication	5. Use the law of exponents to multiply a polynomial by a monomial.
6. Division	6. Use the law of exponents to divide a polynomial by a monomial.
7. Writing polynomial expressions	7. Translate a given English expression to a polynomial.
D. Equations and inequalities	D. To demonstrate a basic understanding of equations and inequalities, the student should be able to:
1. Translation of English statements into algebraic sentences	1. Translate English statements into algebraic sentences; e.g., "5 more than the product of 3 and a given number is 17" translates to "3x + 5 = 17".

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
	1. Add 7 to 3 times a given number. 2. Add 3 times a given number to 7. (Compare #1 and #2) 3. Subtract 7 from 3 times a given number. 4. Subtract 3 times a given number from 7. (compare #3 and #4) 5. Divide a given number by 3, add 4 to the result. 6. Add a given number to 3; divide the result by 4. 7. Add 6 to 3/5 of a given number. 8. The number of cents in 2 dimes and 3 nickels. 9. The cost of n stamps at 10¢ each. 10. 3 + a given number x, plus twice the square of x, minus 8 times the cube of x, divided by 16.
D. Engineers and scientists use equations and inequalities in the design of industrial equipment.	D. The designer of a space vehicle has determined the length must not exceed 100 meters, other design requirements determine that main body should be 9 times as long as the nose cone. What is the maximum length of the main body? Solution: $n + 9n \leq 100$.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
2. Translation of algebraic sentences into English statements.	2. Translate algebraic sentences into English statements; e.g., "$A = \pi r^2$" translates to "the area of a circle is equal to π times the square of the radius. "$(2r)^2$ means the square of twice a number, a number multiplied by 2 and the product squared or the square of the product of 2 and a number.
3. Evaluating algebraic expressions	3. Evaluate expressions such as $3x + 2b$ if $x = 4$ and $b = -7$.
4. Solving open sentences	4. Solve open sentences which involves: a. Equations. b. Inequalities.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
III. Geometry	III. Geometry
A. Definitions and identification	A. To demonstrate a basic understanding of geometry the student should be able to:
1. Point, line, planes space	1. Identify and name point, line, plane, and space.
2. Segment and ray	2. Define and identify segment and ray.
3. Intersecting lines	3. Sketch two intersecting lines.
4. Non-intersecting lines. a. Parallel lines b. Skew lines	4. Illustrate: a. Parallel lines. b. Skew lines.
5. Definitions of angle a. Right b. Obtuse c. Acute d. Complementary e. Supplementary	5. Define angle. a. Right angle. b. Obtuse angle. c. Acute angle. d. Complementary angle. e. Supplementary angle.
6. Perpendicular lines	6. From several given diagrams identify perpendicular lines.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
III. Career Concept Different careers are interrelated. Performance Objectives A. Basic geometry is an integral part of navigation. Geometrical models are frequently used by air navigators as well as sailing navigators.	A. If a sailing navigator wants to travel to a certain island and he knows the position of that island relative to his present position, then he sets a compass course heading in the direction of that island. The geometrical model for the compass course to be followed is a ray with endpoint at the present position and the destination as a point on the ray.  If wind (or current) drift is a factor to be considered, then, in order to allow for the drift, the course setting will differ from the direction of the true destination. The geometrical model would be an angle with vertex at the present position, one ray containing the destination as a point and the second ray containing the course setting. 

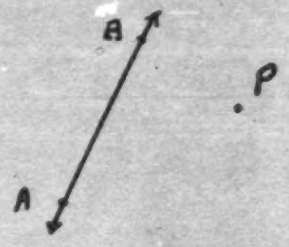
CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
7. Simple closed curves	7. From given diagrams identify the simple closed curves.
a. Polygons	a. Define and identify polygons.
(1) Triangles	(1) Triangles--equilateral, isosceles, right, similar, scalene, acute, obtuse.
(2) Quadrilaterals of all types	(2) Quadrilaterals--rectangle, square, parallelogram, rhombus, trapezoid.
(3) Other polygons	(3) Pentagons, hexagons, octagons.
b. Circles	b. Identify and/or define circle, center, radius, diameter, chord, arc, central angle, circumference.
8. Closed space figures a. Cubes and other prisms b. Pyramids c. Cones d. Cylinders e. Spheres	8. From given diagrams identify: a. Cubes and other prisms. b. Pyramids. c. Cones. d. Cylinders e. Spheres.
B. Perimeter and circumference	B. To demonstrate an understanding of perimeter and circumference, the student should be able to:

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES		RELATED CAREER ORIENTED LEARNING ACTIVITIES	
			Use a compass in setting a course of travel from the classroom to a designated area such as the school library or the principal's office.
	The architect uses a basic knowledge of polygons in creating new designs for building and other construction.		Give some examples of triangles being used to secure rigid construction through bracings or props. Examine a bridge, or a picture of a bridge, to see how the polygon enters into the construction. Make a sketch to show where polygons are used. Examine some pictures of Greek or Roman architecture, for examples of polygons or any polygon used for ornamental purposes, rather than construction purposes.
	A woodcraft designer uses the basic understanding of polyhedra in his work.		Collect information from the local hoppy shops showing the different shapes of the wooden objects. Identify each figure as a rectangular solid, cube, pyramid, cylinder, sphere, or cone. Collect pictures from magazines, catalogs, and newspaper advertisements to identify the many different polyhedra.
B.	A sheet metal worker must have a working knowledge of perimeter in his layout work.	B.	Leon Thomas called a sheet metal shop to purchase skirting for his mobil home. The owner asked for the dimensions of the mobil home, and told Mr. Thomas that skirting of the correct height would cost $1.25 per running foot. If the home was 14' × 70', what would the skirting cost?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
1. Definitions of perimeter and circumference	1. Define perimeter and circumference.
2. Calculations	2. Compute the perimeter or circumference of: a. A square. b. A rectangle. c. Any other quadrilateral. d. A circle.
C. Area of a region	C. To demonstrate an understanding of area, the student should be able to compute the area of:
1. Rectangle	1. A rectangle.
2. Square	2. A square.
3. Triangle	3. A triangle.
4. Circle	4. A circle.
D. Surface area	D. To demonstrate a basic understanding of surface areas, the student should be able to calculate the surface area of:
1. Cube	1. A cube.
2. Rectangular prism	2. A rectangular prism.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES		RELATED CAREER ORIENTED LEARNING ACTIVITIES	
			If the labor for installing the skirting was to be $75, what would the total cost of the job be?
C.	People in construction, in carpeting or tiling floors, and in many other businesses, need to know how to compute areas.	C.	Floor covering is needed for a drive-in hamburger place built in the shape of a circle. If the inside measurement of the building was 28 ft. in diameter, approximately how many square feet of floor covering would be needed? At 48¢ per square foot, installed, what would be the cost of the floor covering? The teacher should provide other learning activities.
D.	The construction industry involves many careers that require computation of surface areas of cubes and other rectangular prisms.	D.	John and his father planned to buy material to build a trophy case. The case was to be 12 ft. long, 4 ft high, and one ft. wide. The front, top, and two ends of the case were to be glass. Compute the number of square feet of glass needed? Compute the number of square feet of plywood needed for the back and bottom of the case? If the plywood that they wanted is sold only in sheets 4 ft. by 8 ft., how many sheets of plywood would they have to buy? (Do not consider shelving).

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
E. Volume of a right circular cylinder and volume of a right prism	E. To demonstrate a basic understanding of volumes, the student should be able to find the volume of: 1. A right circular cylinder. 2. A right prism.
F. Construction	F. To demonstrate a basic understanding of construction, the student should be able to:
1. Line segments	1. Construct line segment equal to a given line segment.
2. Perpendiculars	2. Construct a perpendicular: a. Bisector of a line segment. b. To a line at a given point on the line. c. To a line from a point not on the line.
3. Angle bisector	3. Construct the bisector of a given angle (acute; right; obtuse).
4. Parallels	4. Through a point not on a given line, construct the parallel to the given line.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
E. The oil refinery plant manager must calculate volume.	E. The cylindrical oil tanks at a storage plant have a radius of 45 feet and a height of 110 feet. There are 35 of these tanks. (There are 7.5 gallons in 1 cubic foot.) What is the total capacity of the 35 tanks?
F. A navigator uses parallel lines in plotting the course of his ship.	F. A ship is located at point P near the East coast of the U.S. The captain wants to travel on a course parallel to the East coast. The navigator plots this course by constructing a line through P parallel to the coast. Make the necessary construction.  1. Draw any line through P that intersects line AB at point G. 2. From G, draw an arc that intersects lines PG and AB at F and K respectively. 3. Using the same compass setting from P draw an arc that intersects line PG and T. 4. Measure line segment FK. Set the compass at this measure. 5. From T using compass measure determined in step 4, draw an arc that intersects arc drawn in step 3, and label the point of intersection N. 6. Draw a line through points P and N.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
G. Congruence	G. To demonstrate an understanding of congruence, the student should be able to determine by measurement or from given facts:
1. Segments	1. Congruent segments.
2. Angles	2. Congruent angles.
3. Triangles	3. Congruent triangles.
4. Other polygons	4. Congruent polygons.
H. Problem solving	H. To extend the above concepts and skills the student should be able to solve problems about areas, volumes, and perimeters.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
G. Surveyors can use congruence in determining distance.	G. Use congruence of triangles to explain how the distance across a lake can be determined.
H. People in different careers require different performance skills. However, computational ability is needed in every occupation.	H. A concrete mason needed to calculate the cost of concrete for the following project: The cost of ready mix concrete is $33.95 per cubic yard. Garage floor--20'×20'×4" Drive way--23'×30'×4" What is the total cost of the concrete? Other problems encountered by people in different careers may be found in the text, supplementary texts, or drawn from problems encountered by businesses in the community.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
IV. Measurement	IV. Measurement
A. Metric measurement	A. To demonstrate a basic understanding of metric measurement, the student should be able to:
1. Basic units (using "hands-on" measuring instruments)	1. Use the basic metric units of length (meter) weight (gram), capacity (liter), and temperature (Celsius) in actual measuring activities with metric measuring instruments.
2. Prefixes	2. Define the prefixes commonly used in the metric system: a. Milli (m). b. Centi (c). c. Deci (d). d. Deca (da). e. Hecto (h). f. Kilo (k).
3. Conversion from one metric unit to another	3. Convert measurements which are expressed in given metric units to measurements in other metric units.
4. Problem Solving	4. Use metric measurements to solve problems concerning: a. Perimeters. b. Areas.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
IV. Career Concept Careers require different knowledge, abilities, attitudes, and talents. Performance Objectives	
A. The metric system is used in international sports competition. Therefore, an athlete should have a knowledge of the metric system.	A. Using a yard stick and a meter stick, determine which is longer. In the United States, track and field events include the 100-yard dash. In the Olympic games, the 100-meter dash is used. Which is longer?
The metric system is used in all scientific investigations. Therefore, a chemist must know the metric system.	Density = $\frac{\text{mass}}{\text{unit volume}}$. Find the density of cement, if a piece 2 cm × 2 cm × 7cm weighs 108g. Answer---3g/cm^3.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
B. English measurement	B. To demonstrate a basic understanding of the English units of measurement, the student should be able to name the units and use the measuring devices in the actual measurement of objects.
C. Comparison of metric and English units (using "hands on" measuring instruments)	C. To demonstrate an understanding of the relationship between units of length, weight, capacity, and temperature in the two systems, the student should be able to measure given objects and materials, using measuring devices. He should record the measurements using units of both systems.
D. Rounding and estimation	D. To demonstrate a basic understanding of rounding and estimation, the student should be able to: 1. Give the number of significant digits in a given number. 2. Round to a given number of digits. 3. Estimate answers of given problems.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
B. The U. S. is the only major country which still uses the English system of measurement; for example, the auto industry, the clothing industry, the construction industry, etc.	B. To review the English units, use actual measuring devices to measure weight, length, capacity, and temperature of given objects. Record the measurements.
C. The consumer needs to develop concepts of the relations between the two systems.	C. Measure the same objects using metric devices. Record the measurements on the same table used in "B" above. Notice how the units are related. Make a display of table and articles that express measurements in both systems.
D. People who use measurements in their occupations are actually dealing with approximate numbers. They often round such numbers to a given number of significant digits.	D. Tom, a pilot, uses . 9 gallons of gasoline for each mile flown by his plane. He had 34 7/8 gallons of gasoline. He wants to know approximately how far that much gasoline will take him. He uses rounding and estimates the distance he can travel. How would you estimate the distance?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
E. Scientific notation	E. To demonstrate a basic understanding of scientific notation, the student should be able to: 1. Convert a decimal number to a number expressed in scientific notation. 2. Convert a number expressed in scientific notation to a decimal number.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
E. Physicists are often concerned with very large or very small numbers.	E. The speed of light in a vacuum is 29, 979, 280, 000 cm/sec. Use scientific notation to express the number. Answer: 2.997928×10^{10} cm/sec. The distance from the earth to the sun is 93, 005, 000 miles. Use three significant figures and express the distance using scientific notation. Answer: 9.30×10^{7} miles.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
V. Introduction to Statistics	**V. Introduction to Statistics**
A. Graphs	**A. To demonstrate a knowledge of graphs, the student should be able to construct and interpret the following graphs:**
1. Bar	**1. Bar.**
2. Line	**2. Line.**
3. Circle	**3. Circle.**
4. Other	**4. Other.**
B. Measures of central tendency	**B. To demonstrate a basic understanding of measure of central tendency, the student should be able to:**
1. Organization of data	**1. Organize given data using a frequency table.**
2. Analysis of data	**2. Analyze the given data by determining the:**
a. Mean **b. Median** **c. Mode** **d. Range**	**a. Mean.** **b. Median.** **c. Mode.** **d. Range.**

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
V. Career Concept Some occupations from different career clusters require the ability to statistically evaluate data. Performance Objectives	
A. Many firms use graphs to show significant relationships between quanitities.	A. Collect different types of graphs from newspapers, pamphlets, brochures, and magazines. Interpret the graphs. Make a bulletin board display using some of the graphs.
B. The guidance counselor organizes data gathered at the local level and compares them with state and national levels.	Use the data from the most recent test scores in class to make a frequency table. The following list shows the 10 scores on a recent test. Joe (79) Yvonne (77) Milton (80) Myrtle (80) Louie (75) Margaret (80) Joycelyn (75) Sandra (88) John (82) Ann (81)

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
The statistician applies mathematics in market research and commercial sample surveys.	Complete the mean, the median, the mode, and the range. Detergent — Units of Phosphates Calgon — 75.5 Axion — 43.0 Biz — 40.4 Salvo — 30.7 Punch — 25.8 Ajax Laundry — 25.2 Spic & Span — 23.0 Breeze — 22.2 Cheer — 22.0 Fab — 21.5 Cold Water All — 9.8 Wisk — 7.6 Trent — 1.4
Reserachers gather and organize data.	Gather some data about yourself and some of your friends. You may want to list your weights to the nearest pound, your height to the nearest inch, or your scores on the mathematics test. Make a frequency table from the data. Compute the range, the mode, the median, and the mean.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VI. Enrichment Topics	VI. Enrichment Topics
A. Other Numeration Systems	A. To demonstrate a basic understanding of other numberation systems, the student should be able to:
1. Egyptian and Roman	1. Write a given list of numbers in Egyptian and Roman numerals.
2. Base two and base five	2. Express numbers in: a. Base two. b. Base five.
3. Table Construction a. Addition, base 2 b. Multiplication, base 2 c. Addition, base 5 d. Multiplication, base 5	3. To construct tables: a. Addition, base 2. b. Multiplication, base 2. c. Addition, base 5. d. Multiplication, base 5.
4. Identity elements in other bases for addition and multiplication	4. Identify the identity elements for addition and multiplication in the following systems: a. Base two. b. Base five.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

VI. Career Concept

Individuals seek careers for various reasons.

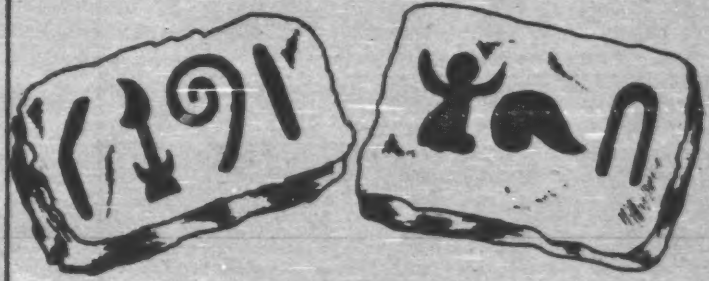
Performance Objectives

A. Historians use both Egyptian and Roman numeration systems.

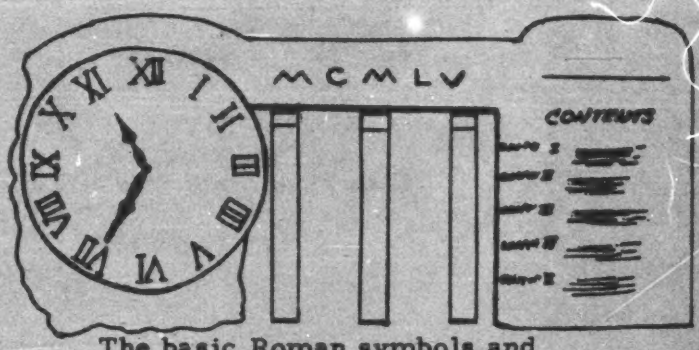
A.

Our Number Symbol	Egyptian Symbol	The Object Pictured
1		A vertical stroke of staff
10		A heel bone
100		A coil or rope or scroll
1,000		A lotus
10,000		A bent finger
100,000		A burbot
1,000,000		An astonished man

Use the chart above to decode the numerals on the stones.



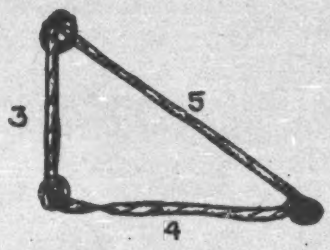
CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
5. Conversion	5. Convert: a. A given number in the decimal system to its equivalent in base two. b. A given number in base two to its equivalent in the decimal system.
B. Tests for divisibility	B. To demonstrate an understanding of divisibility tests, the student should be able to determine the divisibility of any given number by:
1. By 10, 5, 2	1. 10, 5, 2.
2. By 3, 9	2. 3, 9.
3. By 6	3. 6.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
	 The basic Roman symbols and their values are shown below.
	I V X L C D M 1 5 10 50 100 500 1000 Read the chapter numerals, the time on the clock, and the date on the building. Write these numerals in the Hindu-Arabic (decimal) system.
The modern electronic computer is based on the binary system (the base two system).	The devices in electronic computers are like electric lights in that each device has only two states, ON and OFF. This device can represent 1 by an ON-state and 0 by an OFF-state. Using red dots for ON and black dots for OFF, show how the decimal number 6 is represented.
B. An accountant uses certain divisibility tests to check his calculations.	B. Conduct an informal interview of an accountant or a computer programmer to determine how he uses divisibility tests.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
4. By 8	4. 8.
5. By 4	5. 4.
C. History of mathematics	C. To demonstrate a knowledge of the history of mathematics the student should be able to answer the teacher's questions on the historical facts taught in the class.
D. Probability	D. To demonstrate an elementary understanding of probability and chance, the student should be able to:
1. Probability of an event	1. Compute the probability of selecting a red checker from a box which contains 4 red checkers and 8 black checkers.
2. Probability of two outcomes	2. Compute the probability of drawing two blue marbles in succession from a box containing 4 red marbles, 3 white marbles, and 5 blue marbles, given the following condition:
a. With replacement	a. Draw one marble. Replace it, then draw again.
b. Without replacement	b. Draw one marble. Do not replace it, then draw again.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
C. Mathematicians, teachers, and authors of mathematics texts are aware of significant historical facts and developments that have influenced mathematics.	C. Collect reports, mathematical diagrams and pictures that illustrate historical developments in the history of mathematics, etc., for a bulletin board display. Conduct classroom demonstrations of how some measurements determined by the Greeks, Egyptians, and others may be made.
D. Pollsters, weathermen, health authorities, and others use probability. The life insurance actuary, using previously established statistical records and mathematical probability, determines life insurance rates.	D. In a Louisiana city with a population of 19,560, the health authorities estimated that approximately 2,934 people will contact influenza during the winter. What is the probability that a resident will contact influenza?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
E. Squares and square roots	E. To demonstrate a basic understanding of squares and square roots, the student should be able to:
1. Estimating and computing	1. Write the squares of numbers from 1 to 20 and then use the information to compute square roots of given numbers less than 400 by the division and average method.
2. Using the Algorithm	2. Compute the square root of a given number by use of the algorithm.
3. Using tables	3. Compute the square and square root of any given number using a table of squares and square roots.
4. Theorem of Pythagoras	4. Compute the third side of a right triangle when the length of any two sides are given.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
E. Carpenters sometimes use squares and square roots in calculating lengths of braces for gates, supports for shelves, and lengths of rafters for houses when they work from sketches that give only part of the needed information.	E. The Egyptian "rope-stretchers" found that a triangle whose sides are 3 units, 4 units, and 5 units long would be a right triangle. Therefore, a knotted rope 12 units long could be used to lay out a square corner.  Sam wondered if a triangle whose sides were 4", 5", and 6" long would be a right triangle. He used the hypotenuse rule (Theorem of Pythagoras) to decide. He then substituted into the formula $a^2 + b^2 = c^2$. What should he discover?